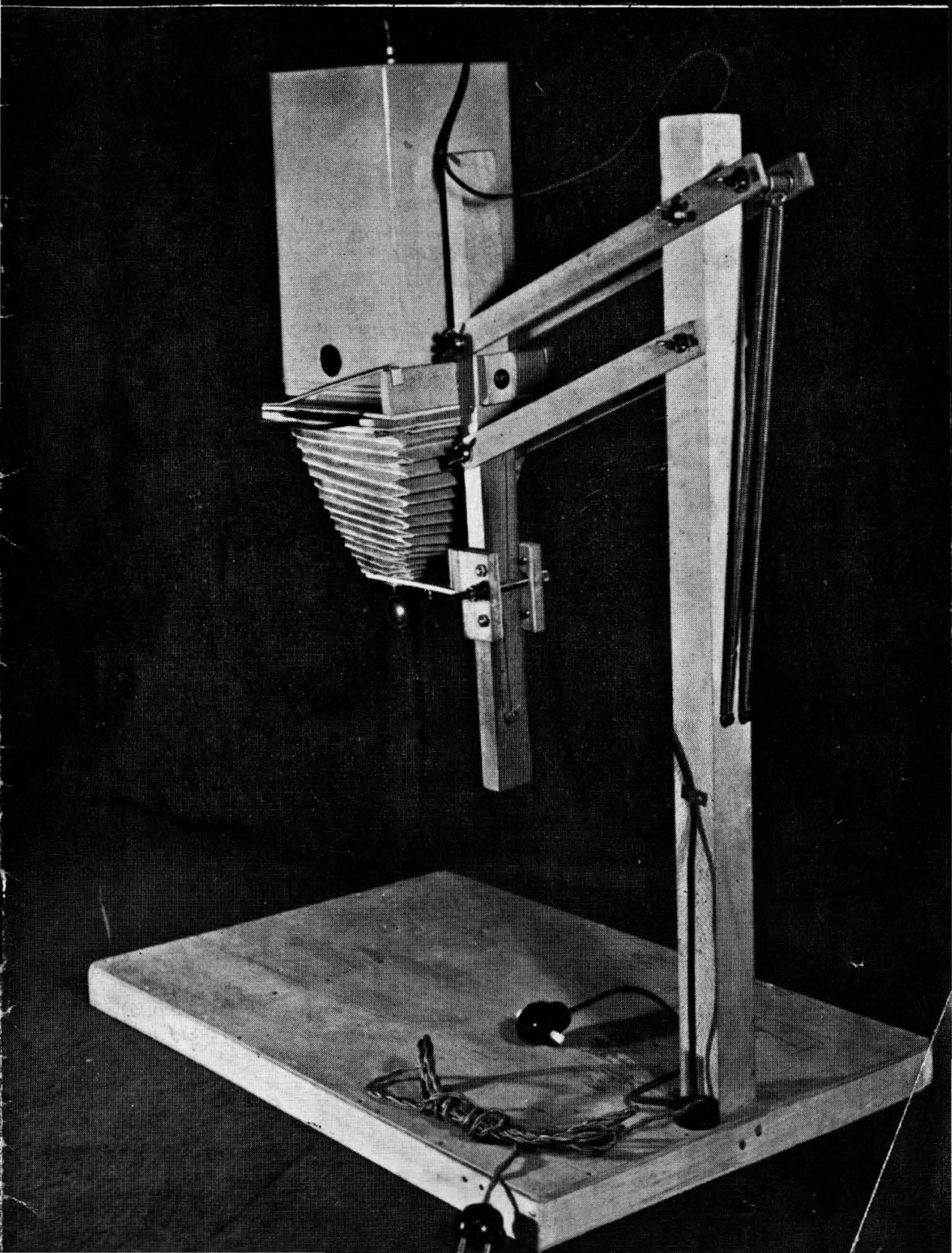
MAKING YOUR OWN ENLARGER



This leaflet is not intended as a complete guide to enlarger making but to serve as an introduction for the intending constructor. For this reason few dimensions are given as these will be largely dictated by the materials available. We regret that we are unable to entertain any correspondence on the subject and refer our readers to the many more comprehensive publications that are available at most photographic dealers.

Some of the dimensions of the enlarger illustrated on the front of this leaflet are: the height of the column, 2′ 4″; width 1½″ × 1½″, length of the wooden arms, lower ones 11″, top ones 13½″, space between bolts 10″, between pivot bolt and counter balance bolt 2¾″. The rod to which the lamphouse and focusing movement is attached is 1½″ wide, ¾″ thick and 20″ long. Height of the tin 10¼″, width of tin 5½″. Width of baseboard 16″, length of baseboard 24″. Focal length of lens 5¼″. Maximum height at top position 3′ 6″. The folding of the bellows (see p. 6) is simple enough once the principle has been mastered but the description of how to do it is too lengthy to come within the scope of this leaflet.

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MAKING PICTURES IS ALWAYS FUN, MAKING ENLARGEMENTS THE BEST FUN OF ALL. A commercially made enlarger may be beyond the pockets of many but a home-made model can be constructed by anyone who can use a few simple tools and will give good results. It may be a little slower in use, many of the conveniences and special fittings will be lacking and it probably won't have the slick appearance of the factory built instrument. But if you know *how* an enlarger works and what the basic requirements are you will find as much fun building your own as you will have using it.

First of all, how does an enlarger work?

When you take a picture with your **camera** you have four essentials working for you. LIGHT, to illuminate your SUBJECT, a LENS to collect the image and to project it on to the LIGHT-SENSITIVE MATERIAL (the film) which records it.

These same four features operate, in just the same order, when you make an enlargement. A LIGHT, usually an electric lamp, which illuminates the SUBJECT, in this case your negative ; a LENS to project the image of the negative on to the LIGHT-SENSITIVE MATERIAL (Bromide paper).

Of course there is a great deal more to it than that but those are the basic principles. The light must be kept inside the lamphouse and only allowed to pass through the negative and lens. It must not leak out at odd cracks and joints to fog your precious paper before you have made your pictures.

There must be some device to ensure that the negative is evenly illuminated. The negative itself will need supporting in such a way that it will keep flat and so that it can quickly be changed. Some method must be found for moving the lens towards and away from the negative for focusing the projected image sharply.

Finally the whole thing must be movable back and forth (or up and down if you are making a vertical model) from the place where you are going to fix your paper. This is to allow for different degrees of enlargement.

LIGHT

Now to take the various parts of the enlarger in greater detail. First the light. So that exposure times are not inconveniently long it will be as well to have the light as powerful as possible. But a big bulb generates a lot of heat. Therefore it must be contained in a well ventilated lamphouse.

Probably the most suitable thing to use for a vertical enlarger would be a large tin such as are used by confectioners to hold 7 lbs. of sweets but equally well the lamphouse could be constructed of wood. The disadvantages of wood are its weight and the possibility of its warping under the heat of the lamp. If a tin is used ventilation must be provided by small holes at the top, suitably light-trapped by, possibly, another tin like a floor polish tin fitted inside and spaced by $\frac{1}{4}''$ or so by the lampholder rings. Holes must also be cut in the side of the tin near the bottom to let cool air in and these can be light-trapped by a small ' bridge ' of tin soldered over them. The main thing is to let the air in and not to let the light out.

In a horizontal enlarger that is slid back and forth from the easel the question of weight is not so important and a more elaborate construction complete with chimney can be used.

The bulb, if a diffuser is being used, should be about 100 to 150 watts, pearl—*not* clear. If the maker's name appears on the end this is best removed with scouring powder and water.

DIFFUSER OR CONDENSER

The easiest (and least expensive) method of ensuring the even illumination of your negative so vitally necessary for good enlarging is to use a piece of flashed opal glass (NOT ground glass). This is fitted at the bottom of the lamphouse (vertical enlargers) just above where the negative is placed. The only disadvantages of a diffused light enlarger are the slightly longer exposure times required (the opal glass holds back a certain amount of light) and the rather ' soft ' appearance of the prints. On the other hand slight blemishes and scratches on the negative are rendered less noticeable.

A condenser, if funds will run to it, has many advantages over an opal diffuser. More light is passed through and greater sharpness and contrast will be seen in the prints. It is heavier, however, and the whole construction of the enlarger will have to be strengthened to allow for the added weight. An enlarging condenser consists of two plano-convex lenses (flat on one side) with their curved surfaces facing one another. They can usually be obtained ready mounted to give the correct spacing. The diameter of the lenses should be slightly greater than the diagonal measurement of the largest negative you propose using (say, $4\frac{1}{2}''$ diameter for a $2\frac{1}{4}'' \times 3\frac{1}{4}''$ negative). This is to ensure that the corners of the negative are properly illuminated. In a condenser enlarger the inside of the lamphouse should be painted with a matt black paint to avoid stray reflections. Also the bulb used (about 100 watts is suitable) should either be opal or white sprayed (NOT pearl or clear).

The distance of the bulb from the condenser should be sufficient to give even illumination. If the projected light (with the lens in position but without the negative) is examined the light patch will have a reddish border if the lamp is too far from the condenser and a blue border if too close. If the lamp is not central uneven shadows will be seen.

NEGATIVE HOLDER

The negative should be held perfectly flat or parts of the picture will be unsharp. The best method of holding it is between two pieces of perfectly clean, blemish-free glass (look out for tiny bubbles or scratches). These glasses can be hinged together with adhesive tape. The negative carrier can be made to slide in at the side just under the lamphouse so that it is exactly under the opal glass or condenser.

The closer the negative is to the condenser the better.

All light other than that passing through the negative should be screened off with a paper mask inserted between the glass ' sandwich.'

ENLARGING LENS

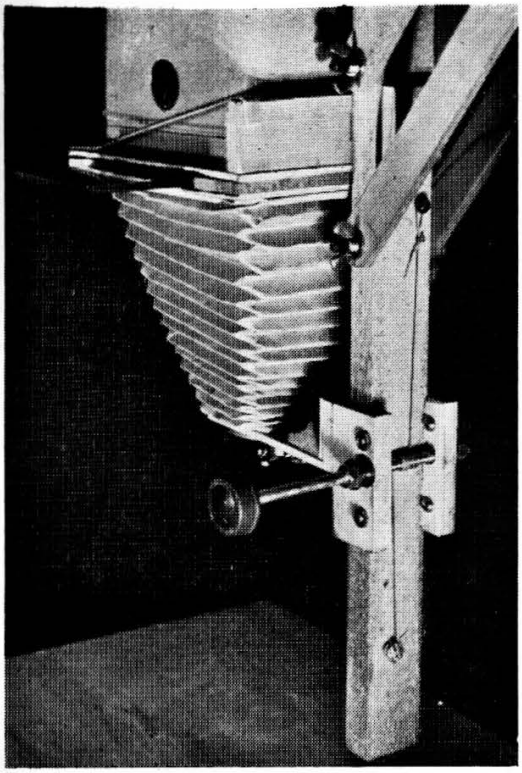
Specially made lenses for enlarging are obtainable but these, if of good quality, are apt to be expensive. Practically as good results can be obtained with a lens from an old camera with the exception of the single-glass type found in box and very cheap folding cameras. These latter will seldom give good results.

The focal length of the lens is important. (The focal length can be found by focusing the sun or a distant light on a piece of paper and noting the distance between lens and sharp image.) The best length to use is approximately that equal to the diagonal of the negative (say 4″ for $2\frac{1}{4}'' \times 3\frac{1}{4}''$). A lens with too short a focal length will not 'cover' properly—that is the edges of the picture will be light and fuzzy. A lens of say, 6″ focal length will cover well but exposures are apt to be long as the enlarger head will have to be farther from the paper to get a good degree of enlargement and so the light will be dimmer.

An old camera lens will be complete with an iris diaphragm. This can be used to get greater sharpness and to make focusing easier.

FOCUSING

The distance between the lens and the negative must be made adjustable for focusing the picture sharply. This is the part that requires the most careful attention. The movement must be perfectly smooth and at no place must light be allowed to escape. In the model illustrated on the cover of this leaflet the bellows were made of thick wrapping paper to keep the cost down but bellows may be adapted from a camera or may be purchased. There are also on the market several admirable focusing movements such as two tubes that screw into one another. Ingenuity here plays a large part. To examine the model shown again the up-and-down movement was obtained by wrapping a piece of thick gut (violin G string) round a $\frac{1}{4}''$ brass rod 6 times and stretching it between two screws. The rod is fitted into a slide holding the lens on a bracket.



Turning the knob winds the lens smoothly up and down. Another popular focusing device for home-made enlargers consists of two tins or cardboard tubes sliding inside one another. Whatever method is employed the movement must be smooth, no part of the tube or bellows must obstruct the light from the negative and, most important of all, the lens must be exactly under the centre of the negative and exactly parallel to it at all times.

MOVEMENT OF THE HEAD

To make enlargements of different sizes the enlarger head must be movable towards and away from the easel or baseboard. In a vertical enlarger care must be taken to see that this movement is free and that an imaginary line drawn through lamp, condenser (or opal glass) negative and lens is at all times exactly at right angles to the board where the paper is fixed. The effect was obtained in the model shown by 4 pieces of wood in which the pivot bolt holes were all drilled exactly the same distance apart (10″). The distance between the bolts in the bar supporting the lamphouse and between the other two in the main column was also similar ($3\frac{1}{2}$″). When assembled they form a parallelogram as seen in the picture. The extension on the top two pieces was made so that springs could be attached to act as a counterbalance but this is just a refinement. Bolts with wing nuts tighten everything when the correct degree of enlargement has been obtained and before making the exposure.

In a vertical enlarger the column to which the head is attached must be really rigid. Any trace of wobble or shake while the prints are being exposed will result in blurred pictures. Instead of the

wooden bar pictured here a metal tube of at least $1\frac{1}{2}$" diameter or larger may be used and means may be devised to make the bracket holding the head slide up and down this, with some kind of clamp for locking it in the desired position. The column, it need hardly be said, must also be exactly at right angles to the baseboard.

ELECTRICAL CONNECTIONS

Enlarging calls for repeated switching on and off. There will be a temptation to fix a switch to the baseboard but there is always a tendency to cause shake when this is done. It is much better to use a ' pear-switch ' on a short length of flex. Wire used should be of good quality and, if the house is fitted with 3 hole sockets, an ' earth ' wire should be attached to the metal lamp house.

The scope of this leaflet does not permit explanations of how to do enlarging, it is only intended to give a guide to the intending constructor. Many firms of high repute in the photographic trade market parts for the home enlarger maker and their advertisements may be found on the photographic magazines. There is lots of fun in building an enlarger yourself and, with a little time spent in hunting up the necessary parts, it need not be expensive. You will find your local photographic dealer a most helpful chap on any point you are not clear about, while membership of a photographic club (there's one in almost every town) will bring you into contact with dozens of enthusiasts all bursting to help the beginner with his photography.

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